



## Smarter Phones Solve Age-Old Health Challenges in Tanzania

*The grassy, dry bottom of an ancient volcanic crater in northern Tanzania that is home to more than 25,000 wild animals is the last place on earth visitors might expect to use a smartphone. But researchers in the area not only use smartphones in the crater to monitor human and animal health, they have figured out a way to leverage the technology to transform a sluggish and inefficient public health system.*

Ngorongoro crater spans 100 square miles with a depth of 2,000 feet, and it is the main feature of the Ngorongoro Conservation Area (NCA), a UNESCO<sup>1</sup> World Heritage Site in Tanzania. The crater is home to nearly every large mammal species found in East Africa, among them: impala, zebra, gazelle, giraffe, rhinoceros, elephant, wildebeest, buffalo, lion, and leopards. Herds of wild grazers mix freely with herds of domesticated cattle, sheep and goats that native Maasai people keep for milk and meat. Most of the time mixing doesn't cause problems, but occasionally deadly pathogens, such as Rift Valley Fever (RVF) virus, spread from wild to domestic animals and then to human keepers. Thousands of livestock may die in one epidemic, causing huge economic loss along with severe illness or death in people.

For example, in the 2006-07 epidemic of RVF in East Africa, more than 1,000 people became ill with fever and at least 300 bled to death from the hemorrhagic form of the disease. Between 31% and 77% of domestic cattle, sheep and goats fell sick, depending on location and size of the herd. It took months of filing reports before health ministries intervened.

The way Tanzania's Ministry of Health and Ministry of Livestock typically handle outbreaks of RVF and other infectious diseases is to send public health workers to the affected area,

who then fill out paper forms documenting cases of disease. It could take four to eight months for a single case to be documented, filed and processed by the appropriate ministry. Only then does the Ministry mount a response. Meanwhile, many epidemics could have already run their course, causing major harm.

But smartphones could transform disease reporting, according to Mark Rweyemamu, executive director of the Southern African Centre for Infectious Disease Surveillance (SACIDS) located at Sokoine University of Agriculture in Morogoro, Tanzania. Rweyemamu believes that Android-based operating systems on mobile phones have advanced enough to replace paper, and thereby, speed reporting of infectious disease outbreaks. He and colleagues at SACIDS won a grant from the Rockefeller Foundation to test the idea in Ngorongoro.

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<sup>1</sup> UNESCO refers to United Nations Educational, Scientific and Cultural Organization ([www.unesco.org](http://www.unesco.org))  
Center for Animal Health and Food Safety – University of Minnesota – [www.cahfs.umn.edu](http://www.cahfs.umn.edu)



Rweyemamu recruited Esron Karimuribo, associate professor of Veterinary Medicine and Public Health at Sokoine University, to manage the smartphone project. Karimuribo grew up in a rural village in eastern Tanzania and completed his veterinary graduate studies in the U.K.

“I continue to feel amazed by the transformative power of new technology, especially in a country like Tanzania, where physical infrastructure is lacking and power outages remain a daily challenge,” explains Karimuribo, who accepted Rweyemamu’s job offer in April 2010, and then asked his friend and long-time collaborator, Kuya Sayalel, to join the team. Sayalel heads veterinary services at NCA, and he is Maasai. In other words, Sayalel has unequalled access to the people and animals of Ngorongoro. With the team and planning complete, project smartphone began sharing data in January 2012.

“I remember the exact day that I received the text. It was the 31st of January 2012,” recalls Sayalel, thinking back to one of the initial texts he received about a disease outbreak. He immediately accessed the case information, reported the case to the nearest dispensary, and headed out to the area with a veterinary clinical officer and public health nurse.

Upon arrival at the affected community, Sayalel and his team found 20 people very sick with stomach pains, vomiting, and diarrhea, and two were in critical condition. They decided to rush two critical patients to the nearest hospital, about 60 km away. Because of fast reporting and quick action, everyone who was ill survived.

In the first 10 months of the project—the time it typically takes to report one or two cases with the old paper system—community reporters documented and filed electronically via smartphone 81 individual case reports of disease, and they received back from public health officials over 100 public health announcements. In the animal health sector, community reporters filed 88 case reports with the project team.

“The data sharing was astounding! But challenges remain, including the fact that health ministries still want a hard copy of all case reports. We work very hard to convince the government that electronic data is a reliable and more efficient alternative to paper, but it’s not an easy task even though the Tanzanian government is definitely ahead of other East African countries,” explains Karimuribo.

The smartphones used in the project contain a digitally reconstructed version of the paper forms required by the various health ministries. Community reporters can attach photos to their reports and also stamp time and GPS coordinates. The uploaded data goes to a server in Karimuribo’s office, which he must keep online 24/7—another challenge because of frequent power outages. Karimuribo has configured a generator to turn on whenever the power quits. Karimuribo then sends the case reports directly to ministry officials, and a process that used to take four months now takes four minutes.



Limited medical response to cases once reported presents a possible barrier to reporting. People who are sick need treatment, but clinics are often hard to reach and treatments limited to whatever is on hand. The situation in Tanzania is not like in wealthier countries, such as the U.S. or U.K., where doctors, nurses and medicines are widely and readily available. This has challenged the project to demonstrate the benefits of early reporting despite infrastructure limitations.

The smartphone pilot project winds down in mid-2013, with a careful transition of the new technology and responsibility for reporting back to the ministries. The collaboration between the organizers at SACIDS, the project field team, and the Tanzanian government has shown that it is possible to radically improve the efficiency of disease reporting by adopting mobile technology, and thereby minimize health and economic losses.

While government agencies adopt the smartphone project, Karimuribo and Sayalel are pushing ahead with another innovative idea in 2013—launching a community radio station in Ngorongoro. They hope the project will increase sharing of information among community members during outbreaks of disease and also link communities to response personnel in the public health and animal health sectors.

“Everyone in Ngorongoro benefits from using the One Health approach—where human health, animal health, government agencies, and researchers work with communities to improve disease surveillance,” says Karimubo. “We’re all in this together.”

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